

## CLAIMS

1. Parallel confocal laser microscopy system comprising:
  - 5       - an array of vertical-cavity lasers (VCSEL) for emitting light beams, and
  - optical means for focusing the light beams onto an object to be observed.characterized in that a photodetector is arranged on one  
10       face of each VCSEL laser such that this photodetector is capable of receiving a light beam originating from said object via the VCSEL laser cavity, this cavity having an opening used as a filtering hole.
- 15   2. System according to claim 1, characterized in that the photodetector is arranged on a face opposite to the cavity opening of the VCSEL laser.
- 20   3. System according to claim 1 or 2, characterized in that it moreover comprises scanning means for carrying out laser scanning so as to produce an image.
- 25   4. System according to any one of the preceding claims, characterized in that it moreover comprises means for controlling the scanning means so as to carry out an acquisition of images in real time.
- 30   5. System according to claim 3 or 4 characterized in that the scanning means comprise MEMS micro-systems.
- 35   6. System according to any one of claims 3 to 5, characterized in that the scanning means comprise piezoelectric positioners.
- 40   7. System according to any one of claims 3 to 6, characterized in that the scanning means are capable of moving the VCSEL laser array.
8. System according to any one of claims 3 to 7, characterized in that the means of scanning are capable of moving optical means.

9. System according to any one of the preceding claims, characterized in that the optical means are capable of directing each light beam originating from the object to be observed towards the cavity of a VCSEL laser.

10. System according to any one of the preceding claims, characterized in that it moreover comprises modulation means for modulating the light beams emitted from the array.

11. System according to claim 10 in which the light beams originating from the object to be observed are modulated, characterized in that it comprises synchronous detection means for extracting a useful signal from the electrical signal generated by each photodetector.

12. System according to any one of the preceding claims, characterized in that the optical means comprise at least one mobile lens for allowing image acquisition at different depths of the object to be observed.

13. System according to any one of the preceding claims, characterized in that the optical means comprise at least one variable curvature lens for allowing image acquisition at different depths of the object to be observed.

14. System according to any one of the preceding claims, characterized in that it comprises means for axially moving the array so as to carry out image acquisition at different depths of the object to be observed.

15. System according to any one of the preceding claims, characterized in that it consists of a miniature head in the form of a housing.

16. Application of the system according to claim 15 in which the miniature head is arranged at the end of an endoscope.

17. Method of parallel confocal laser microscopy in which a plurality of light beams are emitted from an

array of VCSEL vertical cavity lasers, these light beams are focused on an object to be observed; characterized in that a photodetector is arranged on a face of each VCSEL laser so as to receive a light beam originating from the object on this photodetector via the VCSEL laser cavity, and in that the opening of this cavity is used as a filtering hole for the light beam originating from the object.

18. Method according to claim 17, characterized in that laser scanning is carried out so as to produce an image.

19. Method according to claim 17 or 18, characterized in that laser scanning is carried out so as to acquire images in real time.

20. Method according to claim 18 or 19 characterized in that the laser scanning is carried out by moving optical means used to focus the light beams.

21. Method according to any one of claims 18 to 20, characterized in that the laser scanning is carried out by moving the array.

22. Method according to any one of claims 18 to 21, characterized in that MEMS-type micro-systems are used for carrying out the laser scanning.

23. Method according to any one of claims 18 to 22, characterized in that piezoelectric positioners are used for carrying out the laser scanning.

24. Method according to any one of the preceding claims, characterized in that the light beams emitted from the array are modulated and synchronous detection is carried out at the level of the photodetector.